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Use of Open Source Software in Indian Institutional Digital Repositories: A Study

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Abstract: The present paper determines the use of Open Source Software (OSS) in building Indian Institutional Repositories. The paper further covers the use of different OSS, use of OSS in different types of institutions, Indian States / UTs and different disciplines. The data were collected from Open DOAR, ROAR, AGRIS and LIS link Kerala. A total of 209 Open Access Repositories were identified. The outcomes of the study reveal that Dspace and Eprints are the most used OSS in Indian Institutional Repositories; the institutions of Karnataka, New Delhi and Maharashtra State / UTs have used a good number of OSS in developing the Institutional Digital Repositories (IDRs) and the subject discipline like Science, Technology, Health and Medicine were intensely used OSS to develop the IDRs.

Keywords: Open Source Software, Information and Communication Technology, Institutional Repository, Open Access Resources, Open Access Digital Repositories, DOAR, ROAR, AGRIS

1. Introduction

The Information Communication Technology (ICT) has brought immense changes in preservation and accession of traditional information sources. The academic organisations have taken advantages of the ICT and developed proprietary Institutional Digital Repository (IDR). Open Source Software (OSS) applications have opened up the vast opportunities to develop the proprietary IDRs for libraries. The use of OSS not only save a large number of institutional funds but also look after the openness, collaboration and resource sharing with others. The use of OSS is a good way to hold the technological proprietary of an institution [1]. The OSS like Dspace, Eprints, and Fedora are not only assisted storage and preservation problem of the libraries but also facilitates organisation, accession and dissemination of information. Therefore, building an open access IDRs will be a feasible solution to any institution. The open-source software like Dspace, Eprints, Fedora, Greenstone, Open Journal System (OJS) and other such software is promoting the open access scholarly literature. The Open Access Digital Repositories (OADR) is contributing a large amount of literature to the Open Access (OA) pool. As a result, open access to scholarly literature is growing tremendously in the recent past.

2. Earlier Literature

In the recent past, there is an enormous literature published on open source software and open access repositories. Rosa et al. [2] discuss that the institutions must not rely on the old storage method and called for the development of repositories using the OSS. Because, repositories are easy to assimilate, preserve and disseminate the information. Hanumappa et al. [3] explain that few professionals adopt open-source software in libraries. Further, discuss that Dspace, Eprints and Greenstone are the major open-source software used for the development of institutional repositories. The study concludes that only a few professionals have adopted open-source software in libraries. Lihitkar et al. [4] identify that Dspace and Eprints are widely used software for the development of institutional repositories in India. Most of them contain unpublished literature and mainly the contents are available on Science and Technology discipline. For a quite long time, libraries are in quest for alternative proprietary applications to support the user's needs and services [5]. As result, the use of open sources software is relatively increasing in libraries. The LIS professionals are getting expertise in open-source software which has led to the growth of institutional repositories in India [6, 7].

Hulagabali [8] explains that research and higher educational institutions in India like IITs and IIMs are developing institutional repositories. However, very few of them are providing access to the public and most of them allowed to access on the intranet. Sawant [9] discuss that 67 women study centres are established in India but none of them has an institutional repository. However, the author urges the authorities that information which should be accessible to all. Balaji Babu et al. [10] identify that lack of financial support from the institutions, lack of policies at various levels, lack of technical skills, data security and privacy are the major challenges faced while developing institutional repositories in India. Krishnamurthy & Kemparaju [11] discuss that university and college staff needs proficiency and skills in establishing institutional repositories. LIS professionals have a positive attitude towards the changes happening in libraries [12]. The study [13] reveals that most of the repositories in India consist of very low resources. It is observed from these studies that lack of ICT skills hinders the growth of institutional repositories in India. Therefore, Chang [14]

suggested that LIS professionals have to acquire new skills and techniques for the management of the digital collection.

3. Objectives of the Study

The main purpose of the present study is to know the use of open-source software in Institutional Repositories (IRs) in India. The specific objectives are to;

- understand the use of different open-source software used in institutional repositories in different institutions;
- understand the use of open-source software in different subject areas;
- Know the geographical wise distribution and year wise use of open-source software in Indian Institutional Repository.

4. Scope and Methodology

For the present study, the authors are used OpenDOAR which is indexed 93 repositories, the Registry of Open Access Repository (ROAR) listed 124 repositories, repositories listed in AGRIS repository, and repositories listed in LIS link Kerala to collect the data on existing institutional repositories in India. The authors also used various search engines like Google, Duraspace, visited individual websites and library websites of various national importance institutions, universities, colleges and research institutions for identification of the repositories in India. The data were fed into MS Excel. After collecting the data, duplicate and overlapping entries were removed. Finally, the authors identified 209 open access repositories. The data were collected in early January 2020.

5. Data Tabulation and Interpretation

5.1 *Open Source Software Used in Indian Institutional Repositories.*

Table-1: Use of Open Source Software in IRs

Software Name	Code	Software used	Percentage (%)
Architexturez	ARC	1	0.48
CALIBRE	CAL	1	0.48
Drupal	DRU	1	0.48
Dspace	DSP	108	51.67
Eprints	EPR	54	25.84
Greenstone	GSDL	3	1.44
Metastudio	MET	1	0.48
Nitya	NIT	1	0.48
Open Journal System	OJS	1	0.48
Unknown	UKN	38	18.18
Total		**209**	100.00

The table-1 reveals the use of Open Source Software (OSS) for the development of open access institutional repositories in India. It is clear from the table that more than half of the Open Access Repositories (OAR) used Dspace software (51.67%), followed by Eprints (25.84%), Greenstone (01.44%). Among the software, 18.18% (38) of the open-source software names were not known.

5.2 Institutional-wise distribution of Open Source Software

Table-2: Use of Open Source Software in different types of Institutions in India

Type of Institution	ARC	CAL	DRU	DSP	EPR	GSDL	MET	NIT	OJS	UKN	Total
College	1	0	0	19	0	0	0	0	0	1	**21**
Corporate	0	0	0	1	4	0	0	0	1	9	**15**
CSIR	0	0	0	12	23	0	0	0	0	3	**38**
Government	0	0	1	5	1	0	1	0	0	16	**24**
ICAR	0	0	0	5	2	0	0	0	0	0	**07**
ICMR	0	0	0	0	1	0	0	0	0	1	**02**
IIIT	0	0	0	1	1	0	0	0	0	0	**02**
IIM	0	0	0	3	0	1	0	0	0	0	**04**
IIT	0	0	0	7	2	0	0	0	0	2	**11**
IISc	0	0	0	1	1	0	0	0	0	1	**03**
ISI	0	0	0	2	0	0	0	0	0	0	**02**
NIT	0	0	0	2	3	0	0	0	0	0	**05**
Research Institutions	0	0	0	24	6	1	0	0	0	5	**36**
University	0	1	0	26	10	1	0	1	0	0	**39**

Total	**1**	**1**	**1**	**108**	**54**	**3**	**1**	**1**	**1**	**38**	**209**

Table-2 depicts the distribution of OSS among the different types of organisation. It is clear from the study that more number of OSS was used mainly by the Research Institutions and Universities. The CSIR developed 38 OARs and it used 23 Eprints software, Dspace for 12 OARs and the other 03 software names were unknown. The universities (39), CSIR (38) and Research Institutions (36) developed a higher number of IRs. Research Institutions and universities have used 24 and 26 Dspace software respectively. The 24 OARs were developed by Government bodies among them 16 software name was not known.

5.3 Region-wise distribution of Open Source Software

Table-3: Region wise distribution of Open Source Software in India

Name of Region	ARC	CAL	DRU	DSP	EPR	GSDL	MET	NIT	OJS	UKN	**Total**
Northern India	0	0	0	23	11	1	1	0	1	11	**48**
Central India	0	1	0	7	3	0	0	0	0	2	**13**
Eastern India	0	0	0	8	8	0	0	0	0	3	**19**
Western India	1	0	0	27	5	1	0	0	0	8	**42**
Southern India	0	0	1	42	26	1	0	1	0	13	**84**
North-East India	0	0	0	1	1	0	0	0	0	1	**3**
Total	**1**	**1**	**1**	**108**	**54**	**3**	**1**	**1**	**1**	**38**	**209**

Table 3 presents the region-wise distribution of open-source software in India. The Southern States have contributed 84 open source software out of 209 software, followed by Northern States (48), Western States (42). The Central Indian States (13) and North-East Indian states (03) have developed fewer repositories as compared to other Indian states.

5.4 Open Source Software in Indian states/ Union Territories

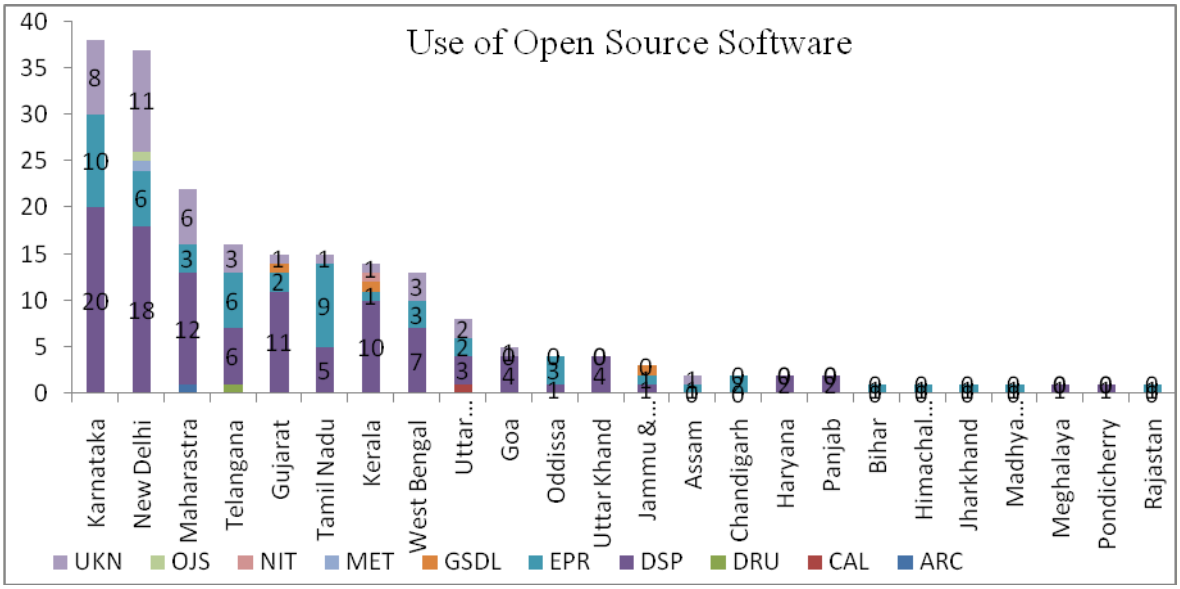

Fig-1: *Use of Open Source Software in India*

The Fig-1 depicts the use of open-source software in open access repositories in Indian states. Out of 29 Indian states and 7 union territories, only 24 states have developed the institutional repositories using open-source software. New Delhi (37), Chandigarh (2) and Pondicherry (1) are the only three union territories which are developed open access repositories. Karnataka has developed the highest number (38, 18.18%) of open access repositories, followed by New Delhi (37, 17.70%) and Maharashtra (22, 10.53%). Telangana (16) Tamil Nadu and Gujarat have developed 15 each open access repositories in India. The top three states/UTs i.e. Karnataka, New Delhi and Maharashtra together developed 46.41% of the institutional repositories in India. The other Indian states/ UTs like Bihar, Himachal Pradesh, Jharkhand, Madhya Pradesh, Meghalaya, Pondicherry and Rajasthan have developed only one institutional repository.

5.5 Subject wise distribution of Open Source Software

Table-4: Use of Open Source Software in different disciplines

Subjects	ARC	CAL	DRU	DSP	EPR	GSDL	MET	NIT	OJS	UKN	**Total**
Agriculture	0	0	0	7	5	0	0	0	0	3	**15**
Architecture	1	0	0	0	0	0	0	0	0	0	**01**
Earth Science	0	0	0	1	2	0	0	0	0	2	**05**
Environmental Science	0	0	0	0	2	0	0	0	0	4	**06**
Health and Medicine	0	0	0	6	6	0	0	0	0	8	**20**

Information Science	0	0	0	0	1	0	0	0	0	0	**01**
Language and Literature	0	0	0	1	1	0	0	0	0	1	**03**
Law and Polity	0	0	1	5	0	0	0	0	0	1	**07**
Library Science	0	0	0	2	0	0	0	0	0	0	**02**
Life Science	0	0	0	3	1	0	0	0	1	4	**09**
Management	0	0	0	8	0	1	0	0	0	2	**11**
Marine Science	0	0	0	4	1	0	0	0	0	3	**08**
Mathematics and Statistics	0	0	0	4	0	0	0	0	0	0	**04**
Metallurgical Science	0	0	0	0	4	0	0	0	0	0	**04**
Multidisciplinary	0	0	0	29	10	1	1	1	0	5	**47**
Physics and Astronomy	0	0	0	5	2	1	0	0	0	1	**09**
Science	0	0	0	3	5	0	0	0	0	1	**09**
Science and Technology	0	0	0	9	6	0	0	0	0	0	**15**
Social Science	0	1	0	2	0	0	0	0	0	2	**05**
Technology	0	0	0	19	8	0	0	0	0	1	**28**
Total	**1**	**1**	**1**	**108**	**54**	**3**	**1**	**1**	**1**	**38**	**209**

Table 4 shows the use of open-source software in a different discipline. For better understanding, the authors have organised these discipline into 20 different categories. Architexturez software (1) used for architecture subject, CALIBRE (1) used for social science subject, Drupal (1) used for Law and Polity. Dspace was used for almost all subjects except 04 subjects. Eprints software also used for the majority (14) of the subjects, mainly in the Science and Technology areas. Among 209 open access repositories, 22.49% (47) of the repositories fall under the multidisciplinary subject area, followed by 13.40% (28) of the repositories developed in Technology subject area and 9.57% (20) of the repositories developed in health and medicine disciplines. The architecture (1), Information Sciences (1) and Library Sciences (2) subject disciplines have developed a meagre amount of institutional repositories.

5.6 Year wise use of Open Source Software in Indian IRs

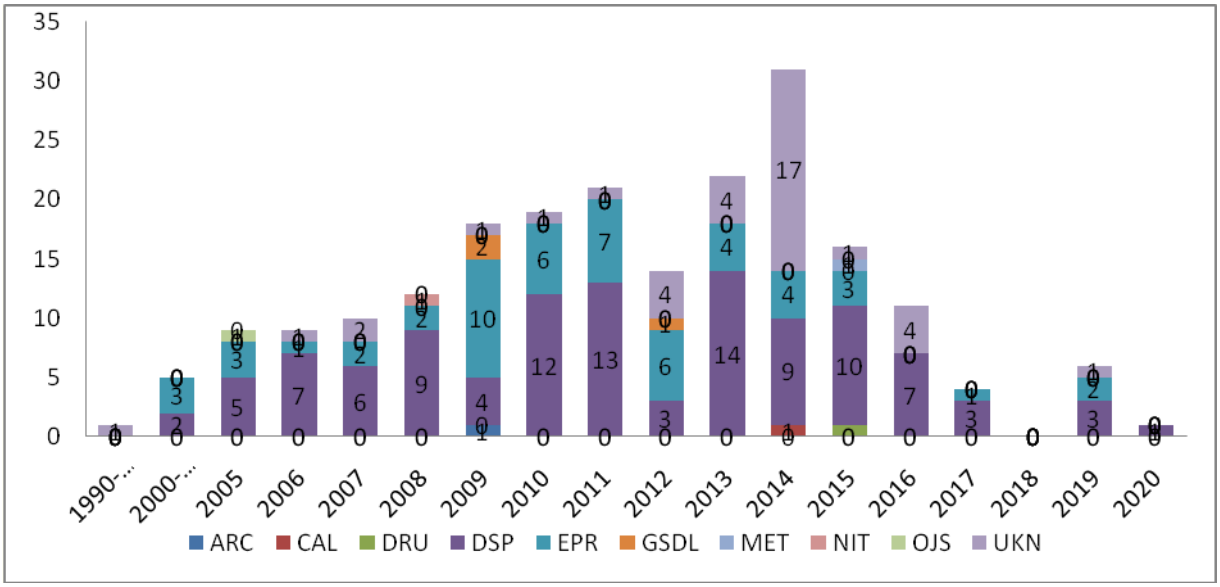

Fig-2: *Use of Open Source Software in Indian IRs*

The Fig-2 shows year wise use of open-source software in Indian Institutional Repositories. The table clearly shows that the use of open-source software is increasing year by year for the development of institutional repositories. The highest (31) number of open source software used in the year 2014, followed by 22 in 2013, 21 in 2011 and 19 in 2010. The Dspace software was used highly (14) in 2013, 13 in 2011, 12 in 2010. Eprints software (10) and Greenstone (2) were used higher in the year 2009. The study reveals that the highest (17) number of unknown software used in the year 2014. The use of open-source software is relatively increasing year by year. Surprisingly, there were no IDRs are developed in 2018.

6. Discussions and Conclusion

The National Knowledge Commission [15] chaired by Sam Pitroda recommended in its report that educational institutions need to facilitate the spread of open educational course contents. In this regard, an open access repository could be developed by the specialists to disseminate the open courseware freely across the country. Further, libraries must encourage by creating more digital information resources by digitising relevant reading materials. Therefore, the UGC [16] issued a notification (Minimum Standards & Procedure for Award of M Phil /PhD Degree, Regulation, 2016) dated 5th May 2016, that the submission of the electronic edition of theses and dissertations by the research fellow in universities is compulsory. The UGC

aims to facilitate universal access to Indian theses and dissertations to the scholarly community.

The present study reveals that Dspace and Eprints are the most used open-source software in Indian institutional repositories. The research institutions and universities are the major players in the use of open-source software in India. However, institutions like IIMs, IITs, NITs and other research organisations have a lot of opportunities to develop the institutional repositories in India. Use and development of IRs in southern states were relatively high compared to other regions. Karnataka, New Delhi and Maharashtra states are highly used the open-source software in developing the IDRs. It clearly shows that the major Metropolitan cities like Bengaluru, New Delhi, Mumbai, Hyderabad and Chennai are engaged in the development of the institutional repositories. The study also shows that the professionals have acquired skills to develop institutional repositories in the metro cities.

The IDRs are a smaller amount appeared in the disciplines like Arts, Humanity and Social Sciences. However, in Science, Technology, Health and Medicine disciplines one could see heavy usage of IDRs. Harnad and Swan [17] discus that India is already set an example for open access movement. By bringing the policies they can optimise their research impact around the world. Therefore, it is suggested that India need to adopt policies for archiving resources at least the public-funded research.

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